3.0 Listed Species Potentially Affected by the Proposed Action

3.1 Introduction

This chapter provides a description of each listed species potentially affected by the proposed action, ESA status, and life history. Table 3-1 summarizes this information.

Table 3-1. ESA Federally Listed and Proposed Species for Consultation and Conferencing on Rogue River Basin Project O&M

Common Name	Status	Scientific Name	Occurs in Rogue River Basin?	Occurs in Klamath River Basin?
Southern Oregon/Northern California Coasts ESU coho salmon [1]	T	*Oncorhynchus kisutch*	yes	yes
Lost River sucker[2]	E	*Deltistes luxatus*	no	yes
Shortnose sucker[2]	E	*Chasmistes brevirostris*	no	yes
Bull trout[4]	T	*Salvelinus confluentus*	no	yes
Northern spotted owl[1]	T	*Strix occidentalis caurina*	yes	yes
Bald eagle	T	*Haliaeetus leucocephalus*	yes	yes
Canada lynx[4]	T	*Lynx canadensis*	no	no
Applegate's milk-vetch[4]	E	*Astragalus applegatei*	no	yes
Gentner's fritillary	E	*Fritillaria gentneri*	yes	no
Large-flowered woolly meadowfoam[3]	E	*Limnanthes floccosa ssp. grandiflora*	yes	no
Cook's lomatium[3]	E	*Lomatium cookii*	yes	no
Vernal pool fairy shrimp[2]	T	*Branchinecta lynchi*	yes	no

E Endangered species as defined in ESA Section 3, 16 U.S.C.S § 1532
T Threatened species as defined in ESA Section 3, 16 U.S.C. § 1532

[1] Critical habitat has been designated
[2] Critical habitat has been proposed
[3] Designation of critical habitat has been deferred
[4] These species are not found in the action area and are only briefly addressed in this chapter of the BA

3.2 SONCC Coho Salmon

3.2.1 ESA Status

NMFS (Federal Register 62:24588) listed SONCC coho salmon (*Oncorhynchus kisutch*) as threatened on May 6, 1997, under provisions of the ESA. This evolutionarily significant unit (ESU) of coho salmon inhabits coastal rivers and streams between Cape Blanco in southern Oregon to Punta Gorda in northern California. Most of the remaining natural production in this coho salmon ESU takes place in the Rogue, Klamath, Trinity, and Eel River basins (Figure 3-1). The Rogue River basin and Klamath River basin contain naturally reproducing populations of this coho salmon ESU.

NMFS published a final rule designating critical habitat for SONCC coho salmon effective June 4, 1999, which encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon inclusive. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of coho salmon (Federal Register 64:24049). Inaccessible reaches are those above specific dams as identified in Table 6 of the Federal Register [Iron Gate Dam, Emigrant Dam and Agate Dam] or above longstanding naturally impassable barriers (natural waterfalls in existence for at least several hundred years) (Federal Register 64:24049).

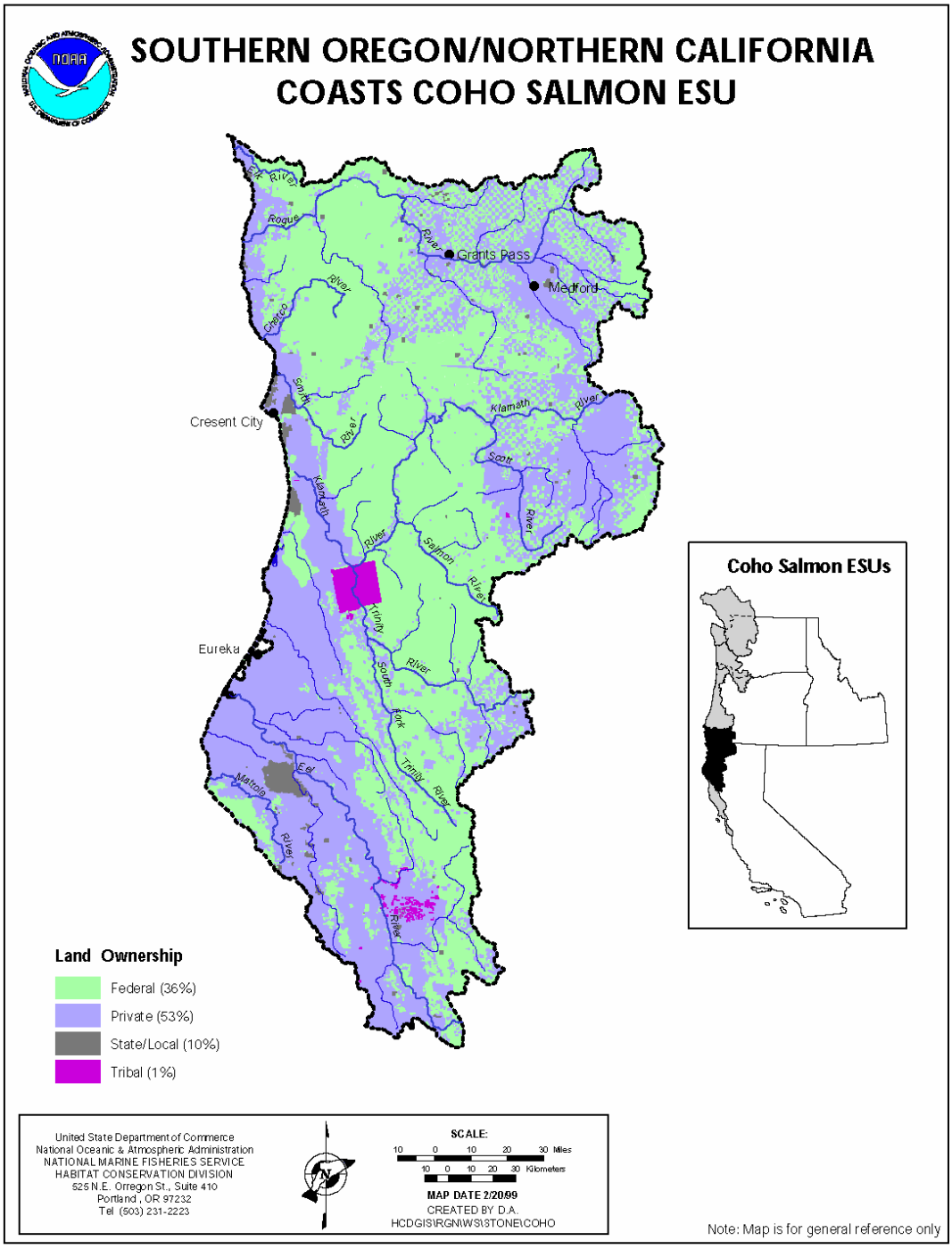

Figure 3-1. Southern Oregon/Northern California Coasts Coho Salmon ESU.

3.2.2 Location

Rogue River Basin

The SONCC coho salmon occur throughout the Rogue River basin in southern Oregon. This analysis focuses on coho salmon runs in Bear Creek and its tributaries downstream from Emigrant Dam, South Fork Little Butte Creek downstream from the waterfalls on South Fork Little Butte Creek to the confluence with North Fork Little Butte Creek, mainstem Little Butte Creek, Antelope Creek, and continuing downstream to the confluence with the Rogue River.

Klamath River Basin

Anadromous salmonids in the Klamath River are restricted to the mainstem Klamath River and tributaries below Iron Gate Dam. No passage facilities exist at Iron Gate Dam. This analysis focuses on the mainstem Klamath River downstream from Iron Gate Dam, located at approximately RM 190, in northern California.

3.2.3 Life History Summary

In contrast to the life history patterns of other Pacific salmonids, coho salmon generally exhibit a relatively simple three-year cycle. They spend approximately 18 months in fresh water and 18 months in salt water. Adult coho return to fresh water to spawn primarily as three-year old fish although some will return as two-year old precocious males (jacks or grilse) (Leidy and Leidy 1984). The percent of jacks within a run can vary greatly from year to year. Coho jacks are not sterile and can actively spawn and fertilize eggs. In some rare cases a female may return as a two-year old (Scott and Crossman 1973).

Adult coho salmon migrate into the Rogue and Klamath Rivers from September through January. Fish will hold in the estuary with upstream movement usually triggered by increased flows due to fall rains (Scott and Crossman 1973; Sandercock 1991). Upstream movement occurs during the day. In general, earlier migrating fish spawn farther upstream within a basin than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991).

Coho salmon normally spawn in tributary streams from November through February (peaking in January) (Table 3-2). Spawning is concentrated in riffles or in gravel deposits at the downstream end of pools with suitable water depth and velocity.

Coho salmon eggs incubate for approximately seven weeks between November and March (Scott and Crossman 1973). The duration of incubation depends on ambient water temperature, usually between 4.4 and 13.3 °C (39.9 and 55.9 °F) (Hassler 1987). Fish remain in the gravel as fry for about 2-3 weeks until yolk is absorbed, then emerge as free-swimming actively feeding fry (Scott and Crossman 1973). Emergence typically occurs from February to mid May.

Most coho salmon young remain in freshwater for at least one year before migrating to the ocean. Juvenile coho salmon will initially take up residence in shallow, gravel areas near the streambank (Scott and Crossman 1973). Later in the summer fish will move into deeper pools seeking slow moving water and structure for cover. Fish activity, feeding, and growth rates are dependent on water temperature. Preferred rearing temperatures of 11.7 to 14.4 °C (53 to 58 °F) (Bell 1990) allow fish to grow quickly, as they feed primarily on insects (Scott and Crossman 1973, Sandercock 1991). Young coho salmon also eat other smaller fish when available (Scott and Crossman 1973, Sandercock 1991).

Juvenile coho salmon normally rear in streams about 15 months and begin migration to the ocean during their second spring. Peak smolt migration seems to occur in May. Timing of migration varies among individuals based on physiological development and fish size and other variables such as photoperiod, streamflow, and water temperature (Craig 1994). Rate of downstream migration appears to be related to size, larger fish travel faster (USFWS 1992). Once smolts reach the estuary, they spend up to one month in tidewater acclimating to salt water before entering the open ocean. The fish will then spend two summers growing at sea before returning to spawn. Coded-wire tag returns from SONCC coho salmon captured during their second year at sea have been mostly recovered off the California coastline indicating a southerly migration pattern (Federal Register 62:24588).

Table 3-2 illustrates the normal coho salmon life-cycle phases when the fish are in freshwater.

Table 3-2. Freshwater Coho Salmon Life Cycle

Life Stage	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Spawning												
Egg Incubation/Fry Emergence												
Juvenile Rearing												
Smolt Outmigration												

Source: Prevost et al. 1997, Leidy and Leidy 1984

Rogue River Coho Salmon Runs

The Rogue River coho salmon run consists of returns from both stream spawning fish (natural/wild production) and upper basin hatchery releases. Adult coho salmon begin entering the Rogue River in September.

The early October run of middle and upper basin fish pass over Gold Ray Dam on the Rogue River at RM 127.7 (just downstream from Bear Creek's confluence with Rogue River) (Prevost et al. 1997). A substantial component of this run returns to the Cole M. Rivers Hatchery (Jacobs et al. 2000).

Table 3-3 lists the annual number of coho salmon counted passing through the fish ladder at Gold Ray Dam from 1942 to 2000 (Ritchey 2001). Coho salmon are tallied passing the dam from September 15 to January 30. The adult run for the latest 10-year period averaged 10,618 fish with hatchery fish comprising 77 percent of the run. The year 2000 return of 28,791 hatchery and wild coho salmon was a record run. Since hatchery coho salmon first began to return in 1977, hatchery production has provided a majority of the spawner escapement to the upper river. An exception occurred in 2000 when wild coho salmon returns outnumbered hatchery fish.

Final counts in 2001 and 2002 were not completed as of March 2003, but preliminary estimates indicate that approximately 28,000 total adult coho salmon passed Gold Ray Dam in 2002 (Pellissier 2003). Principal tributary streams upstream from Gold Ray Dam where wild coho salmon return to spawn are Little Butte Creek, Trail Creek, Big Butte Creek, and Elk Creek.

Table 3-3. Adult Coho Salmon Passage at Gold Ray Dam

Year	Wild Number	Percent	Hatchery Number	Percent	Total	Total Jacks < 20 inches	Hatchery Jacks < 20 inches
1942	4,608	100			4,608	217	
1943	3,290	100			3,290	201	
1944	3,230	100			3,230	336	
1945	1,907	100			1,907	84	
1946	3,840	100			3,840	211	
1947	5,340	100			5,340	166	
1948	1,764	100			1,764	85	
1949	9,440	100			9,440	406	
1950	2,007	100			2,007	237	
1951	2,738	100			2,738	230	
1952	320	100			320	7	
1953	1,453	100			1,453	134	
1954	2,138	100			2,138	231	
1955	480	100			480	46	
1956	421	100			421	23	
1957	1,075	100			1,075	77	
1958	732	100			732	84	
1959	371	100			371	18	
1960	1,851	100			1,851	94	
1961	232	100			232	2	
1962	457	100			457	0	
1963	3,831	100			3,831	318	
1964	168	100			168	0	
1965	482	100			482	12	
1966	178	100			178	0	
1967	89	100			89	0	
1968	149	100			149	0	
1969	530	100			530	0	
1970	160	100			160	65	
1971	181	100			181	0	
1972	185	100			185	0	
1973	193	100			193	0	
1974	146	100			146	0	
1975	154	100			154	3	
1976	44	100			44	17	
1977	12	2	510	98	522	15	
1978	244	32	512	68	756	116	
1979	201	12	1,543	89	1,744	1,555	
1980	1,629	29	3,988	71	5,617	2,631	
1981	2,683	40	4,042	60	6,725	577	
1982	597	89	73	11	670	475	
1983	796	53	697	47	1,493	748	
1984	2,139	66	1,097	34	3,236	469	

Year	Wild Number	Percent	Hatchery Number	Percent	Total	Total Jacks < 20 inches	Hatchery Jacks < 20 inches
1985	459	39	711	61	1,170	348	
1986	1,474	36	2,598	64	4,072	647	
1987	1,527	28	3,868	72	5,395	960	
1988	3,558	52	3,324	48	6,882	643	
1989	268	19	1,133	81	1,401	141	
1990	212	30	485	70	697	62	
1991	195	8	2,367	92	2,562	253	
1992	0	0	4,006	100	4,006	920	
1993	756	22	2,730	78	3,486	1,698	
1994	3,265	31	7,434	69	10,699	1,525	1,077
1995	3,345	25	10,173	75	13,518	1,404	832
1996	2,554	19	11,045	81	13,599	2,055	1,228
1997	4,566	29	11,184	71	15,750	1,152	694
1998	1,310	22	4,734	78	6,044	1,284	1,034
1999	1,417	18	6,305	82	7,722	1,282	956
2000	15,652	54	13,139	46	28,791	6,332	3,652
10-year average	3,306	23	7,312	77	10,618	1,791	1,353
Average all years	1,746	72	4,071	28	3,402	519	1,353
Source: Ritchey 2001							

Naturally spawning fish typically hold in the mainstem Illinois and Rogue Rivers to await fall rains and higher flows before ascending smaller spawning tributaries. Spawning can occur from November into February depending on the sufficiency of flow conditions. Figure 3-2 illustrates the variation in coho spawn timing in recent years for streams in Oregon. The South Coast figure is for streams surveyed mostly in the middle and upper Rogue River basin.

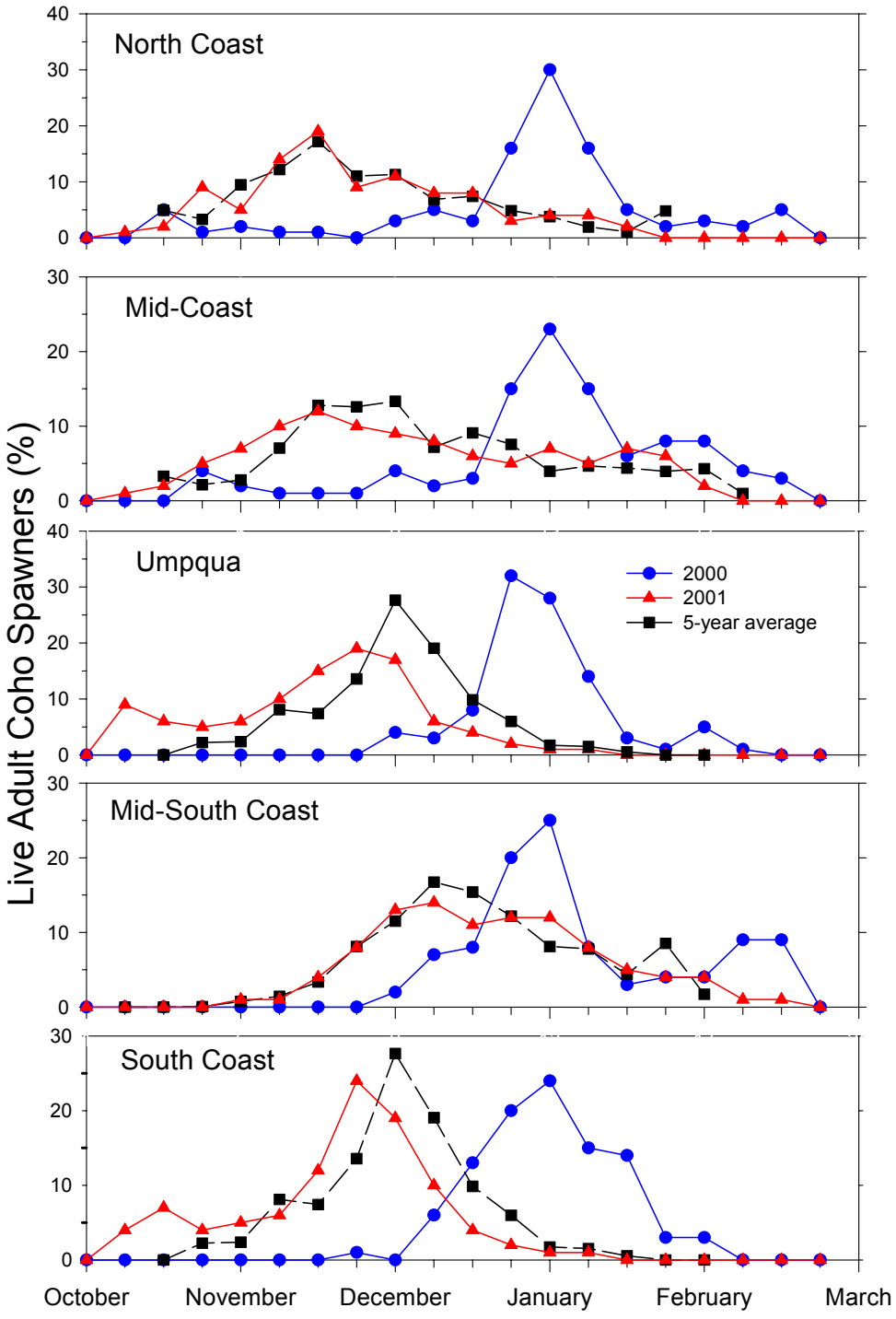

Figure 3-2. Periods of Natural Coho Spawning Observed in Oregon Coastal Streams (Jacobs 2003)

Rogue River Coho Salmon Hatchery Production

The Cole M. Rivers Hatchery began operations in 1975 and is the only hatchery that produces coho salmon for release in the Rogue River. The hatchery is located on the Rogue River at the base of Lost Creek Dam about 153 river miles from the ocean. It was built to mitigate for wild salmon and steelhead losses associated with construction of the U.S. Army Corps of Engineers' (USACE) Lost Creek Dam, Applegate Dam, and the partially completed Elk Creek Dam.

The USACE's goal to annually return 2,060 adult hatchery coho salmon is accomplished by rearing and releasing 200,000 hatchery smolts at 10 fish per pound (ODFW 1998). The NMFS' ESA 4(d) rule and hatchery operation protocols allow for substantial use of wild coho salmon trapped at the hatchery (up to 15 percent of the total estimated wild return to the entire Rogue River basin) for broodstock (Frank 2000). This program is managed principally to maintain an artificial reserve of SONCC coho salmon in the Rogue River that can be used for additional recovery actions in the future if deemed appropriate (ODFW 1998).

To implement the coho salmon hatchery production program, 150 male and 150 female adult spawners (150 pairs) are used in the egg take. Coho salmon return to the hatchery collection trap from October through January and annual returns vary widely. Female spawners average 8-9 pounds with males averaging 10-11 pounds. Protocol guidelines call for spawning 75 ripe pairs before and 75 pairs after December 15. Typically, many excess hatchery origin fish are culled to charitable organizations and, more recently, carcasses are being placed in select tributaries for nutrient enrichment (Frank 2000). Wild fish returning to the hatchery trap in excess to broodstock needs are liberated into natural spawning areas upstream from Gold Ray Dam.

Each year's egg batch is raised in the controlled hatchery environment for about 16 months. Prior to release to the river as smolts, 150,000 fish are marked with an adipose fin clip only, 25,000 are adipose clipped and implanted with a coded-wire tag, and 25,000 are marked with a coded-wire tag only (NMFS 1998). The adipose clip is an external mark so fishermen can identify the hatchery fish component available for harvest in marine or river sport fisheries. All 200,000 smolts are released each year directly to the Rogue River at the hatchery location around May 1. Hatchery raised coho salmon are released in no other Rogue River basin locations.

Klamath River Coho Salmon Runs

Adult coho salmon migrate into Klamath River from mid-September through mid-January (Leidy and Leidy 1984, Shaw et al. 1997). Fish destined for Iron Gate Hatchery first arrive in early October with the greatest number arriving around the first of November (FishPro 1992). Coho salmon returns to Iron Gate Hatchery have been recorded since 1963 and have ranged from zero fish in 1964 to 2,893 fish in 1987 (Pisano 1998). Between 1992 and 2000, an annual average of 1,205 adult coho salmon were enumerated at Iron Gate Hatchery (NMFS 2002). Typically, all returns to Iron Gate Hatchery are ready to spawn by the first of January (FishPro 1992).

Klamath River system coho salmon normally spawn in tributary streams from November through February with spawning peaking in January (Leidy and Leidy 1984). However, coho salmon have been observed spawning in side channels, tributary mouths, and shoreline margins of mainstem Klamath River between Independence Creek (RM 86) and Beaver Creek (RM 150) (Shaw 1996). Adult coho salmon and coho salmon redds are occasionally observed during Chinook salmon spawning and carcass surveys in the Klamath River. For example, in 2001, six redds with adult coho salmon holding nearby were observed in the mainstem Klamath River between Iron Gate Dam and Interstate 5 (NMFS 2002).

Klamath River basin coho salmon outmigrate from February through mid-June (Leidy and Leidy 1984, Weitkamp et al. 1995). The peak downstream movement usually occurs between April and May (Leidy and Leidy 1984). The USFWS operates downstream juvenile migrant traps on the mainstem Klamath River. Trapping at the Big Bar Rotary Screw Trap on the Klamath River (RM 48) during the spring of 1994 collected smolt coho salmon from March through June with peak numbers observed in mid-May (Craig 1994). Timing of the peak is consistent with observations from trapping conducted in 1988 and 1989 (USFWS 1992). The Big Bar Trap caught an annual average of 548 smolts (range 137-1,268) between 1991 and 2000 based on abundance indices developed for juvenile coho salmon (USFWS 2000a).

Klamath River Coho Salmon Hatchery Production

Iron Gate Hatchery released an average of about 150,000 coho salmon from 1987 to 1991. Klamath River coho salmon runs are now composed largely of hatchery fish although there still may be wild runs remaining in some tributaries. Stock transfers, because of the predominance of hatchery stocks in Klamath River basin, into the Trinity and Iron Gate Hatcheries may have had a substantial impact on natural populations in the Klamath basin. (Federal Register 64:24049)

3.3 Lost River and Shortnose Suckers

3.3.1 ESA Status

The Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) were federally listed by USFWS under the ESA as endangered on July 18, 1988 (Federal Register 53:27130). These large, long-lived suckers are endemic to the Upper Klamath River basin of Oregon and California. USFWS published a proposed rule designating critical habitat for Lost River and shortnose suckers on December 1, 1994 (Federal Register 59:61744). No final rule for critical habitat has been completed as of the date of this BA.

3.3.2 Location

Currently, there are three major populations of shortnose suckers in the Upper Klamath basin found in Upper Klamath Lake, Clear Lake, and Gerber Reservoir. There are two major populations of Lost River suckers in the Upper Klamath basin found in Upper Klamath Lake and Clear Lake, along with a very small population in Tule Lake. Upper Klamath Lake contains the largest populations of shortnose suckers and Lost River suckers. (USFWS 2002)

Shortnose suckers may spawn successfully in tributaries to Iron Gate Reservoir as documented by the presence of sucker larvae in 1998 and 1999. However, the species of sucker larvae could not be identified, and it is not known which sucker species was successful. Shortnose sucker spawning may also occur in the Klamath River downstream from Copco 2 Reservoir in Iron Gate Reservoir.

The Klamath River reservoir population receives individuals carried downstream from upper reaches of the river, but they are isolated from the Upper Klamath basin by dams and show no evidence of self-sustaining reproduction (USFWS 2002).

Iron Gate Reservoir

Iron Gate Reservoir is the most downstream reservoir on the Klamath River extending from RM 198.6 to RM 190. The dam was constructed in 1962 and does not possess a fish ladder or juvenile bypass system. Iron Gate Reservoir has a surface area of 944 acres with a shoreline distance of about 19 miles. Maximum depth is about 160 feet but much of the reservoir is more than 35 feet deep with steeply sloped banks. Only small isolated pockets of wetland vegetation exist around the perimeter of the reservoir.

Iron Gate Reservoir has two perennial tributaries, Fall and Jenny Creeks, and two intermittent streams, Camp and Scotch Creeks. Approximately 1.5 miles of Klamath River flows between the upper end of Iron Gate Reservoir and Copco 2 Reservoir.

Jenny Creek flows into Iron Gate Reservoir from the north. The lower 2 miles of Jenny Creek are accessible to suckers migrating from the reservoir. Two waterfalls block upstream fish passage beyond this point. Elevation at the creek mouth is 2375 feet.

3.3.3 Life History Summary

The Lost River and shortnose suckers occur only in the Klamath River basin. Both species reside primarily in the deeper water of lake habitats and spawn in tributary streams or at springs within lake habitat. These are long-lived species, living over 30 years. (Federal Register 67:34422)

Sucker spawning can begin as early as February and continue through May. Tributary spawning generally occurs in riffle areas with moderate current and gravel/cobble substrates. The small eggs hatch in about 1-2 weeks and then remain in the substrate another week. After absorbing most of their yolk, the larvae swim out of the gravel and migrate downstream. Larval and early juvenile suckers occupy shoreline habitats while older juveniles and adults use offshore areas.

No information is available on sucker spawning or rearing in Jenny Creek.

The life history of the Lost River and shortnose suckers is included by reference (USFWS 2002). Other extensive detailed background information on Lost River and shortnose suckers and their proposed critical habitat is incorporated by reference into this BA. This information is found in:

- biological assessments (Reclamation 1992, 1994, 1996, 2001a, 2002)
- biological opinions (USFWS 1992, 1994, 1996, 2001a, 2002)
- 1993 Sucker Recovery Plan (USFWS 1993)

3.4 Bull Trout

3.4.1 ESA Status

Bull trout (*Salvelinus confluentus*) were listed by USFWS as threatened, with special rules pursuant to the ESA, for the Klamath River distinct population segment on July 10, 1998 (Federal Register 63:31647). The special rules allow the take of bull trout in the Klamath River population segments if in accordance with State and Native American Tribal fish and wildlife conservation laws and regulations and USFWS approved conservation plans. (Federal Register 63:31647)

3.4.2 Location

Rogue River Basin

Bull trout are not known to exist in the Rogue River basin.

Klamath River Basin

Bull trout occur only as resident forms isolated in higher elevation headwater streams within three of the Klamath River basin watersheds: Upper Klamath Lake, Sprague River, and Sycan River (Federal Register 63:31647). In 1996, bull trout were estimated to occupy approximately 38.2 kilometers (22.9 miles) of streams in the Klamath River basin (Federal Register 63:31647). A 1997 estimate indicated that bull trout occupied approximately 34.1 kilometers (20.5 miles) of streams (Federal Register 63:31647). These areas are outside the Project action area.

3.4.3 Life History Summary

Bull trout exhibit four distinct life history forms: resident, adfluvial, fluvial, and anadromous. Bull trout feed upon terrestrial and aquatic insects, macrozooplankton, mysids, and fish, with fish being the primary diet for individuals over 4-inches long. Growth depends on the life form of the fish. Bull trout reach lengths of 4 to 6 inches within the first 2 to 3 years. Adult spawners within resident populations generally range from 6 to 12 inches long. Migratory forms attain much larger sizes. Adfluvial bull trout are the largest, ranging from 12 to 34 inches long. Fluvial bull trout range from 11 to 21 inches. The more productive environments occupied by adult migratory populations account for the size differences (University of Idaho 2001).

This BA discussion focuses on the resident life-history form of bull trout species. Information was excerpted in its entirety from Federal Register 63:31647.

Resident bull trout spend their entire lives in the same (or nearby) small, headwater stream in which they spawned and reared. Resident and migratory forms may be found together and may produce offspring exhibiting either resident or migratory behavior. Resident adults range from 150 to 300 millimeters (6 to 12 inches) total length.

Bull trout habitat requirements are more specific than other salmonids. Bull trout distribution and abundance is influenced by water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors. All life history stages are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Stream channel and flow stability is needed to maintain bull trout habitat.

Bull trout are found in the coldest water within a given watershed. Water temperatures above 15° C (59° F) are thought to limit distribution of the fish. Spawning areas are associated with cold-water springs, groundwater infiltration, and the coldest streams in the watershed.

Preferred spawning habitat consists of low gradient streams with loose, clean gravel and water temperatures of 5 to 9° C (41 to 48° F) in late summer to early fall. The size and age of bull trout at maturity depends upon life-history strategy. Resident fish grow more slowly than migratory fish and tend to be smaller at maturity and less fecund. Bull trout reach sexual maturity in 4 to 7 years and live as long as 12 years. Repeat and alternate year spawning has been reported.

Spawning occurs from August to November during periods of decreasing water temperatures. Temperatures during spawning range from 4 to 10° C (39 to 51° F) and redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater. Spawning substrate consists of loose, clean gravel relatively free of fine sediments. This condition is vital to egg survival and emergence of young. Incubation lasts from 100 to 145 days, depending on the water temperature.

Females build redds or nests at the downstream end of pools. The redds often overlap, causing females to compete aggressively for nesting sites. Females release eggs into the nest from one to three times at 10-second intervals, depositing up to 5,000 eggs. Once the eggs have been laid, the male releases sperm. The female then covers the fertilized eggs with gravel (University of Idaho 2001). Eggs generally

incubate for 100 to 145 days and hatch in late winter or early spring. The incubation period requires water temperatures of 34-43 °F. Newly hatched bull trout (alevins) take 65 to 90 days to absorb their yolk sac. Emergence from the redd typically occurs in early April through May after a peak instream discharge. Water temperatures continue to play an important role in embryo and juvenile development and survival. Egg-to-fry survival rates are reported as 0-20 percent at 46-50 °F, 60-90 percent at 43 °F, and 80-95 percent at 36-41°F (University of Idaho 2001).

3.5 Northern Spotted Owl

3.5.1 ESA Status

The USFWS added the northern spotted owl (*Strix occidentalis caurina*) to its list of threatened species on June 26, 1990 (Federal Register 55:26114) and designated critical habitat on January 15, 1992 (Federal Register 57:1796). In 1992, the USFWS developed a draft recovery plan for the northern spotted owl which, to date, has not been published.

3.5.2 Location

The current range of the northern spotted owl is southwestern British Columbia, western Washington, western Oregon, and the coast range area of northwestern California south to San Francisco Bay. The majority of spotted owls are found in the Cascades of Oregon and the Klamath Mountains in southwestern Oregon and northwestern California (Federal Register 55:26114).

There is one designated critical habitat unit, OR-38, in the Project area located near Hyatt Reservoir and Howard Prairie Lake. The critical habitat unit is on BLM administered lands (Leal 2001).

3.5.3 Life History Summary

Typical habitat of the northern spotted owl occurs in mountainous areas with old growth forest characterized by multilayered canopy and uneven-aged stands with overstory trees ranging from 230 to 600 years old, however; forest age is not the primary factor determining habitat suitability.

Younger forests provide suitable habitat for spotted owls if the forest contains necessary elements such as: 60-80 percent canopy closure; a multi-layered, multi-species canopy dominated by large (>30 inches) overstory trees; an abundance of

large trees with various deformities (e.g., cavities, snags); large accumulations of fallen trees and other woody debris; and adequate open space below the canopy for flight. These necessary components are most often associated with stands over 200 years in age; however, spotted owls have been observed using relatively young forests (60+ years) that contain the key components of suitable owl habitat. Younger forests containing a significant quantity of older trees and snags remaining from earlier stands that were affected by fire, wind storms, and incomplete timber cuts, are particularly likely to provide suitable spotted owl habitat (Federal Register 60:9483).

Northern spotted owls are primarily nocturnal predators of small mammals particularly northern flying squirrels (*Glaucomys sabriius*), woodrats (*Neotoma spp.*), and red tree voles (*Phenacomys longicaudus*) (Marshall et al. 1996, USFWS 1995). Spotted owls can be characterized as long-lived raptorial birds that form nesting pairs which generally remain together to breed for many years. Nesting pairs do not attempt to build a nest and breed every year and failed attempts at reproduction are not unusual. Intermittent breeding attempts may be related to fluctuations in prey availability. The owls nest in cavities or platforms created by abandoned raptor nests, squirrel nests, debris accumulations, and mistletoe brooms.

Nesting activity occurs between February and March and one to four eggs are laid shortly after nest completion. Chicks are fledged between mid-May and June but continue to receive parental care into September. At that time, the juvenile owls will be on their own. Starvation and predation by great horned owls claim the majority of the 88 percent of subadults that do not survive through their first year (Federal Register 55:26114).

Adult northern spotted owls maintain a home range territory all year. The size of their territory can vary depending on the time of year, the amount of old-growth and mature forest available, and a suitable prey base. Within Oregon, median annual pair home ranges were estimated to be 2,955 acres for the Cascades and 4,766 acres for the Coast Range (Federal Register 55:26114).

3.6 Bald Eagles

3.6.1 ESA Status

In 1967, the Secretary of the Interior listed bald eagles (*Haliaeetus leucocephalus*) south of the 40th parallel as endangered under the Endangered Species Preservation Act of 1966. Following enactment of the Endangered Species Act of 1973, the

USFWS listed the species as endangered throughout the lower 48 states, except in Michigan, Minnesota, Oregon, Washington, and Wisconsin where it was designated as threatened. Due to the overall population increase, the bald eagle was reclassified in 1995 from endangered to threatened in all 48 lower states (Federal Register 60:36000). Most recently, in 1999, the USFWS proposed delisting this species because eagle populations are rebounding significantly and overall goals of the recovery program have been met. If the bald eagle is removed from the threatened and endangered species list it will remain a protected species under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

3.6.2 Location

Five currently active bald eagle breeding territories are found within the action area at Hyatt Reservoir, Howard Prairie Lake, and near Emigrant Lake on Slide Creek. The Slide Creek nest is outside the action area but the eagles may forage at Emigrant Lake.

The nest at Hyatt Reservoir is within Cascade-Siskiyou National Monument and is managed by the BLM. The nest on Slide Creek is on BLM administered lands.

3.6.3 Life History Summary

Within the action area bald eagles are living, reproducing, and wintering around Reclamation's reservoirs. These large, open bodies of water support fish and waterfowl that are the eagle's primary prey. The surrounding forest ecosystem is also home to birds and mammals (and their carcasses) with which eagles supplement their fish diet. Forested lands surrounding the reservoirs, especially the higher elevation Hyatt Reservoir and Howard Prairie Lake, have trees suitable for nesting and perching.

Eagles generally choose to build nests in trees that occur in uneven-aged stands with old growth characteristics (USFWS 1986). Usually these trees are among the tallest in the stand allowing for an unobstructed view of a waterbody from which most of the prey is obtained. Nesting pairs often build more than one nest in their breeding territory in case the primary nest is destroyed. The same nest is often reused over successive years with the addition of nest materials. Nest trees typically have sturdy upper branches to support the large nest which is approximately 2-3 feet deep and 5 feet in diameter. Bald eagle nests in the Klamath River basin and the Cascade Range are found primarily in Ponderosa pine and secondarily in Douglas fir trees.

The breeding season for bald eagles in the Pacific Northwest generally extends from January to mid August. Chicks are usually fledged in July but may remain near the nest for several weeks after fledging. Bald eagles are extremely sensitive to human disturbance during the breeding season. Human activities are known to cause abandonment of nests and failed attempts at reproduction (USFWS 1986).

Habitat for bald eagles outside the breeding season consists of daytime perches and nighttime communal roosts. A good perch site is one located close to a food source and has a clear view of the surrounding area. Nighttime communal roosts are near food sources, offer more protection from the elements than daytime perches, and are isolated from human disturbance. Eagles will use artificial perches where suitable natural perches are unavailable (USFWS 1986).

3.7 Canada Lynx

3.7.1 ESA Status

The contiguous U.S. population of Canada lynx (*Lynx canadensis*) was listed by USFWS as threatened on March 24, 2000, under the ESA. The U.S. listing extends protection to Canada lynx in 13 states including Oregon. USFWS determined establishing critical habitat is beneficial for the conservation of Canada lynx and will designate critical habitat in the future. A recovery plan has not yet been developed (Federal Register 65:16051).

3.7.2 Location

There have been 12 verified Canada lynx records for Oregon in the past century. Based on the timeframes when collected and locations in atypical habitat, some of these records likely were dispersing transient individuals. The most recent lynx observations (post 1985) were from the Cascade Range and Blue Mountains in northeast Oregon. Based on the limited available information, the USFWS concluded that lynx have always occurred intermittently in Oregon, but they could not substantiate either an historic or current presence of a resident lynx population in Oregon. (Federal Register 65:16051)

3.7.3 Life History Summary

The large, broad feet of Canada lynx allow them to move easily in deep snow cover and pursue snowshoe hares, and therefore, they have a competitive advantage over

other carnivores like bobcat and coyotes in snow. Lynx in Canada forage almost exclusively on snowshoe hare. When snowshoe hare populations are low, lynx broaden their diet to include squirrels, mice, voles, carnivores, ungulates, and birds (Verts and Caraway 1998).

The Canada lynx diet in southern extensions of their range is not well researched. The density of snowshoe hare is lower than in northern extensions of Canada lynx usage. Small mammal communities are composed of different species, and habitat is patchier than in Canada and Alaska. Biologists believe the lynx's diet differs from the nearly exclusive snowshoe hare diet of central and northern populations. Southern lynx populations consume alternate prey species opportunistically and with greater frequency (Ruediger et al. 2000).

Canada lynx primarily inhabit boreal forests of Alaska, Canada, and the northern contiguous United States (Verts and Caraway 1998). Its historic range within the lower 48 states includes southern boreal forests of the Cascade Range in Washington and Oregon. It occurs in subalpine coniferous forests at elevations receiving deep snow (Federal Register 65:16051).

3.8 Applegate's Milkvetch

3.8.1 ESA Status

Applegate's milkvetch (*Astragalus applegatei*) was federally listed by USFWS as endangered without critical habitat on August 27, 1993 (Federal Register 58:40547). An approved recovery plan for Applegate's milkvetch was published by USFWS in 1998.

3.8.2 Location

Applegate's milkvetch is restricted to flat-lying, seasonally moist, alkaline soils of the Klamath River floodplain between Klamath Falls and Keno in Klamath County, Oregon. The known occurrences of Applegate's milkvetch are east of the Klamath River, near the city of Klamath Falls. These sites are outside the Project action area.

3.8.3 Life History Summary

Applegate's milkvetch is a perennial plant species within the legume family (Fabaceae). It grows approximately 12 inches high with trailing stems 10 to 33 inches long and leaves 1.5 to 5 inches long. It reproduces only by seed during June,

July, and early August. Most pollination occurs by butterflies and bees; the Melissa blue butterfly is one known pollinator. However, the anthers and stigma ripen at the same time enabling the plant to self-pollinate. The milkvetch produces pea-like flowers with lavender-tipped white petals and seed pods between 0.3 and 0.5 inches long containing three to ten dark seeds. Long distance seed dispersal is not evident. Most seedlings establish near mature plants. Some seed distribution may occur through ingestion by rodents (Federal Register 58:40547, USFWS 1998).

Astragalus species usually grow in moisture deficient environments. However, Applegate's milkvetch also grows on moderately moist soils where a hardpan layer exists. Alkaline soils (pH 7.9-9.6) are unnecessary for life history but are preferred by Applegate's milkvetch and reduce competition from other plant species (Federal Register 58:40547, USFWS 1998).

3.9 Gentner's Fritillary

3.9.1 ESA Status

Gentner's fritillary (*Fritillaria gentneri*) was federally listed by USFWS as endangered January 10, 2000, without designated critical habitat (Federal Register 64:69195). The availability of a draft recovery plan was announced by USFWS in November 2002 (Federal Register 67:70452).

3.9.2 Location

Gentner's fritillary is found only in the rural foothills of Jackson and Josephine counties, southwestern Oregon. The species occurs as single plants or in small, widely scattered clusters of plants. Gentner's fritillary grows in or on the edge of dry, open woodlands of fir or oak at elevations below about 1360 meters (4450 feet). The species is localized within a 48 kilometer (30 mile) radius of the city of Jacksonville cemetery.

3.9.3 Life History Summary

Gentner's fritillary is a perennial herb belonging to the lily family (Liliaceae). It has a fleshy bulb and a sturdy stem that grows 20-28 inches high. The stems and leaves have a blue-tinted waxy coating. The leaves are arrow shaped, grow 3-6 inches long, and are often whorled. The bell-shaped flowers are 1.4-1.6 inches long and are reddish purple with pale yellow streaks. The flowers are solitary or in groups of up to

five on long pedicels. The flowering season is from April to June; however, not every plant will flower each season. Many of the plants remain dormant for one to several years and will not produce above-ground stems and flowers. Reproduction occurs when bulblets break off and form new plants (Federal Register 64:69195).

3.10 Vernal Pools and Associated ESA Listed Species

Vernal pools are seasonal (springtime) wetland features which form in shallow depressions underlain by a hard pan or clay pan layer impervious to the downward percolation of surface water. The pools hold water for a short period of time until warming springtime temperatures evaporate the water. This annual wetting and drying-out cycle, typical of the area's Mediterranean climate, favors plant species different in character and composition from nearby upland habitats and plant species found in permanent wetland ecosystems. (Federal Register 67:59884)

The ESA species associated with vernal pools are:

- Large-flowered woolly meadowfoam (3.11)
- Cook's lomatium (3.12)
- Vernal pool fairy shrimp (3.13)

Two factors influence development of vernal pools:

- Mediterranean climate with wet and dry seasons. Mild temperatures predominate during the winter-spring wet season when the precipitation rate exceeds the rate of evaporation and the pools fill. Temperatures quickly rise during the dry season, when the rate of precipitation drops far below the rate of evaporation. The pools dry out during the dry season.
- Soil layer impermeable or nearly impermeable to water. An impermeable hard pan or clay pan layer at or near the surface prevents the downward percolation of water. Trapped surface water and rainfall fills the pool depression.

Vernal pools are a prominent feature of the Agate Desert. The Agate Desert landform is characterized by a gentle mound-swale or prairie-mound topography. Agate-Winlow Complex soils hinder water percolation allowing fall and winter rains to fill the swales forming a pattern of shallow pools. The ephemral pools vary in size from 1 to 30 meters (3 to 100 feet) across, maximum depth about 30 centimeters (12 inches) (Federal Register 65:30941).

3.11 Large-Flowered Woolly Meadowfoam

3.11.1 ESA Status

The large-flowered woolly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*) was listed by USFWS as an endangered species effective December 9, 2002. Critical habitat designation has been deferred. (Federal Register 67:68004)

3.11.2 Location

Large-flowered woolly meadowfoam is known from the Agate Desert in Jackson County, Oregon. This is an 83-square kilometer (32-square mile) landform in southwestern Oregon. This plant occurs on lands owned by The Nature Conservancy, Jackson County, ODFW, city of Medford, and private landowners. Large-flowered woolly meadowfoam is not presently known to occur on Federal lands within the Project action area.

3.11.3 Life History Summary

The large-flowered woolly meadowfoam is a delicate annual in the meadowfoam or false mermaid family (Limnanthaceae). This plant typically grows 5 to 15 centimeters (2 to 6 inches) tall. Leaves are approximately 5 centimeters (2 inches) long, divided into 5 to 9 segments, and are sparsely covered with short, fuzzy hairs. The flowers, particularly the calyx (outer whorl of floral parts), are densely covered with woolly hairs. The five petals are 6 to 13 millimeters (0.2 to 0.5 inches) long, yellowish to white in color, and have two rows of hairs near each petal base.

Large-flowered woolly meadowfoam grows on the wetter, inner fringe of vernal pools. This species adapted to life in vernal pool habitats by growing, flowering, and setting seed in the short period of time while water is available in spring (Federal Register 65:30941). Populations of this plant are usually in full flower around late March to early April and set seed in late May and June. Seeds germinate as early as December and as late as the first part of March depending on precipitation (Borgias 2001).

3.12 Cook's Lomatium

3.12.1 ESA Status

Cook's lomatium (*Lomatium cookii*) was listed by USFWS as an endangered species effective December 9, 2002. Critical habitat designation has been deferred until such time as resources allow. (Federal Register 67:68004)

3.12.2 Location

Cook's lomatium is known from the Agate Desert in Jackson County and French Flat in the Illinois Valley, Josephine County, Oregon. This plant occurs on lands owned by The Nature Conservancy, ODFW, city of Medford, Oregon Department of Transportation, BLM, and private landowners. The Agate Desert is an 83-square kilometer (32-square mile) landform in southwestern Oregon. French Flat is outside the action area and is not discussed further.

3.12.3 Life History Summary

Cook's lomatium is a perennial forb in the carrot family (Apiaceae). The plant typically grows 6 to 20 inches tall from a thin, twisted taproot that often branches at ground level to produce multiple stems. The leaves are smooth, finely dissected, and strictly basal, growing directly above the taproot on the ground rather than along the stems. One to four groups of clustered, pale-yellow flowers produce boat- or pumpkin-shaped fruits 0.3 to 0.5 inches long. This species adapted to life in vernal pool habitats by growing, flowering, and setting seed in the short period of time while water is available in the spring (Federal Register 65:30941).

3.13 Vernal Pool Fairy Shrimp

3.13.1 ESA Status

The vernal pool fairy shrimp (*Branchinecta lynchi*) was listed by USFWS as a threatened species in September 1994 (Federal Register 59:48136). Critical habitat was proposed on September 24, 2002 (Federal Register 67:59884). There are three proposed critical habitat units in the Agate Desert, these units comprise a functional vernal pool complex consisting of vernal pools and mounded prairie and associated uplands (Federal Register 67:59884).

3.13.2 Location

Vernal pool fairy shrimp are found in 27 counties across the Central Valley and coast ranges of California, inland valleys of southern California, and southern Oregon. (Federal Register 67:59884)

In Oregon, vernal pool fairy shrimp are known to occur on the Upper and Lower Table Rock Preserve, north of Medford, and on a landform known as the Agate Desert, an area of approximately 32 square miles or 83 square kilometers (Federal Register 67:59884 and 67:68004). Proposed critical habitat in the Agate Desert totals approximately 2,700 hectares (about 6,700 acres) (Federal Register 67:59884). Crustacean populations occurring on lands owned by The Nature Conservancy are protected from development (Federal Register 65:30941). Upper and Lower Table Rock Preserve is outside the action area and is not discussed further.

This species has a sporadic distribution within vernal pool systems. The majority of known populations inhabit vernal pools with clear to tea-colored water, most commonly in grass or mud-bottomed swales or basalt flow depression pools in unplowed grasslands. Water in pools inhabited by this species has low total dissolved solids, conductivity, alkalinity, and chloride (Federal Register 59:48136).

3.13.3 Life History Summary

Vernal pool fairy shrimp have delicate, elongated bodies ranging from 0.4 to 1.0 inch long. They have large, stalked, compound eyes, no carapace, two pair of antennae, and 11 pairs of swimming legs. They swim upside down (ventral side up) using their legs to beat in an anterior to posterior direction. Most feed on algae, bacteria, protozoa, rotifers, and bits of detritus.

Vernal pool fairy shrimp have developed a desiccation-tolerant stage within their life cycle as an adaptation to existing within temporary bodies of water (Graham 1997). This strategy is known as cryptobiosis, an adaptation in which organisms have at least one stage in their life cycle that can tolerate extreme desiccation; some species are able to lose up to 92 percent of their body water and still survive. In ephemeral pools, cryptobiosis is usually limited to the egg or cyst stage of an animal's life history.

Branchiopod crustaceans are among the better known cryptobiotic species, having cryptobiotic cysts that pass the vernal pool dry phase in pool sediment and are extremely tolerant of heat and cold as well as prolonged desiccation. Some, but not all, of the cysts may hatch when the pools refill with rainwater. The cyst bank in the

soil may be comprised of cysts from several years of breeding (Federal Register 59:48136).

Branchiopod crustacean cope with climatic variability by producing eggs with differing diapause characteristics in each clutch. Some hatch after drying and getting wet again. Others go through more than one dry and wet cycle before they hatch. It is not definitively known what other cues operate to break dormancy in addition to wetting the cysts, but water temperature, changes in oxygen levels, solute concentrations, or changes in pH may be involved for different species. Although being adapted to cope with the inherent variability of climate patterns, branchiopods can be adversely affected by more rapid shifts of environmental conditions or shifts beyond the range of normal variation (Graham 1997).

The early stages of the fairy shrimp develop rapidly into adults. These nondormant populations often disappear early in the season long before the vernal pools dry up (Federal Register 59:48136). The time required to reach maturity and start producing the next generation of viable cysts varies greatly among species, even within the same pool, depending on genetic controls and environmental influences (Graham 1997). Although vernal pool fairy shrimp can mature quickly allowing populations to persist in short-lived shallow pools, they also persist later into spring where pools are longer lasting (Federal Register 59:48136).